Claims

[c1] 1.A hydrogen gas detector calibration system, comprising:
a mixing tube;
a first conduit in fluid communication with a hydrogen-free gas, wherein the first conduit comprises a first orifice in fluid communication with the mixing tube;
an electrolysis cell for generating hydrogen gas;
a second conduit in fluid communication with the hydrogen gas, wherein the second conduit comprises a second orifice in fluid communication with the mixing tube; and
the hydrogen gas detector in fluid communication with the mixing tube.

[c2] 2.The hydrogen gas detector calibration system of Claim 1, further comprising:
a first flow regulator in operable communication with the first conduit;
a second flow regulator in operable communication with the second conduit; and
a controller in operable communication with the first and second flow regulator.

[c3] 3.The hydrogen gas detector calibration system of Claim 1, wherein the mixing tube comprises a container with at least one open end.

[c4] 4.The hydrogen gas detector calibration system of Claim 1, wherein the mixing tube comprises a closed container, and wherein the hydrogen detector is disposed within the closed container.

[c5] 5.The hydrogen gas detector calibration system of Claim 4, wherein the electrochemical cell system further comprises an enclosure and wherein the mixing tube further comprises a third conduit in fluid communication with the closed container and an environment within the enclosure.

[c6] 6.The hydrogen gas detector calibration system of Claim 1, wherein an outlet of the first orifice is disposed in a location diametrically opposed to an outlet of the second orifice.

[c7] 7.The hydrogen gas detector calibration system of Claim 1, further comprising a hydrogen/water separation device in fluid communication with the electrolysis

cell, wherein a gas portion of the hydrogen/water separation device is in fluid communication with the second conduit.

[c8] 8.A process for calibrating a hydrogen gas detector, comprising:
introducing hydrogen-free gas to the hydrogen detector, wherein the hydrogen gas detector generates a first signal;
introducing a known quantity of hydrogen gas from a hydrogen/water separator to the hydrogen gas detector, wherein the hydrogen gas detector generates a second signal corresponding to a concentration hydrogen; and
calibrating the hydrogen gas detector based upon the first and second signals.

[c9] 9.The process according to Claim 8, further comprising mixing the hydrogen gas with hydrogen-free gas prior to introduction to the hydrogen gas detector, and wherein the mixture of the hydrogen gas and the hydrogen-free gas has a known hydrogen concentration.

[c10] 10.The process according to Claim 8, wherein the hydrogen gas and the hydrogen-free gas are at about ambient pressure.

[c11] 11.A process for operating an electrochemical system, comprising:
calibrating a hydrogen gas detector by
passing a hydrogen-free gas through a first conduit to the hydrogen detector, wherein the hydrogen gas detector generates a first signal;
flowing a known quantity of hydrogen gas from a hydrogen/water separator through a second conduit to the hydrogen gas detector, wherein the hydrogen gas detector generates a second signal corresponding to a percentage of the hydrogen gas in the mixture; and
calibrating the hydrogen gas detector based upon the first and second signals;
introducing water to an electrolysis cell;
producing hydrogen;
separating hydrogen from water in the hydrogen/water separator;
introducing environmental gas disposed around electrochemical system components to the hydrogen gas detector; and
determining the hydrogen concentration in the environmental gas.

[c12] 12.The process according to Claim 11, wherein the calibration of the hydrogen gas detector further comprises mixing the hydrogen gas with hydrogen-free gas prior to introduction to the hydrogen gas detector, and wherein the mixture of the hydrogen gas and the hydrogen-free gas has a known hydrogen concentration.

[c13] 13.The process according to Claim 11, further comprising introducing hydrogen and oxygen to a fuel cell stack and generating electricity.

[c14] 14.The process according to Claim 11, wherein calibrating the hydrogen gas detector further comprises generating additional signals, wherein each one of the additional signals corresponds to a different percentage of the hydrogen gas, and calibrating the hydrogen gas detector with the additional signals.

[c15] 15.The process according to Claim 11, wherein the hydrogen gas and the hydrogen-free gas are at about ambient pressure.

[c16] 16.The process according to Claim 11, purging the electrochemical system if the hydrogen gas concentration exceeds a selected amount.

[c17] 17.A process for operating a hydrogen gas detector, comprising:
automatically calibrating the hydrogen gas detector with a controller, wherein calibrating the hydrogen gas detector comprises exposing the hydrogen gas detector a hydrogen-free gas to determine a baseline, directing hydrogen gas from an electrochemical cell to a mixing tube to form a mixture having a known hydrogen concentration, exposing the hydrogen gas detector to the mixture to generate a signal corresponding to the known hydrogen concentration, and adjusting a reading of the hydrogen gas detector based upon the known concentration of hydrogen gas in the mixture; and
automatically sampling an environment around the electrochemical cell system with the hydrogen gas detector.

[c18] 18.The process according to Claim 17, wherein the hydrogen-free gas and the hydrogen gas are at ambient pressure.

[c19] 19.The process according to Claim 17, wherein the hydrogen-free gas

comprises air.

[c20] 20.The process according to Claim 17, further comprising directing the hydrogen gas from the electrochemical cell, through a hydrogen/water separation device and to the mixing tube.